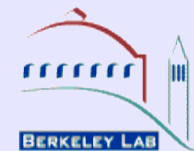# LowpT: Chasing the $\Delta\phi$ excess
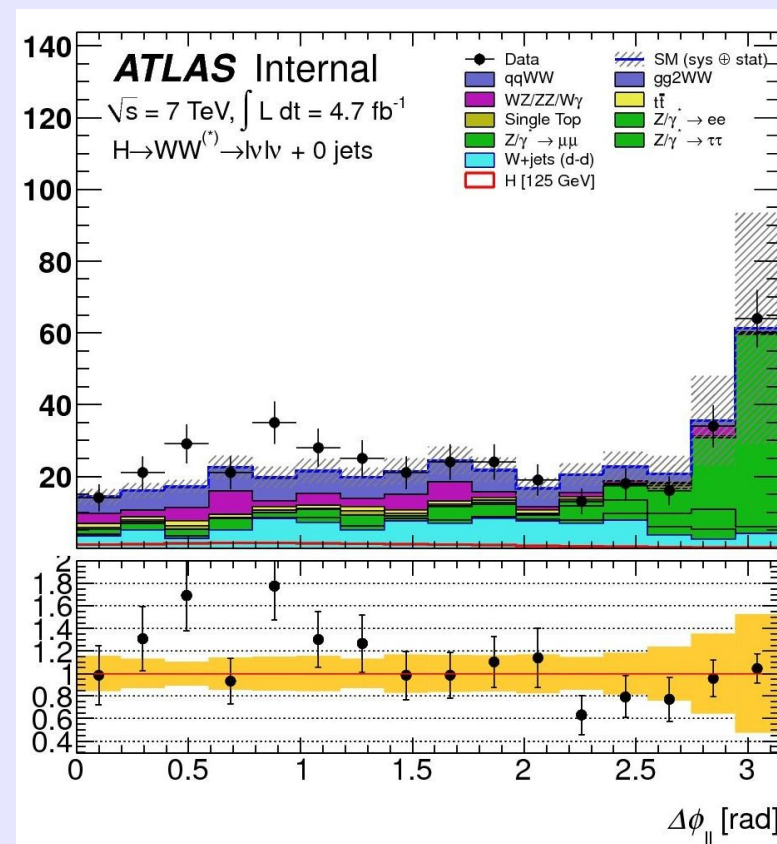
Lina Galtieri, Bill Quayle, Simone Pagan Griso

Outline:

Excess : 28 +- 12 events

Looking at shapes of distributions for data and background in the 2011 sample (2011 analysis)
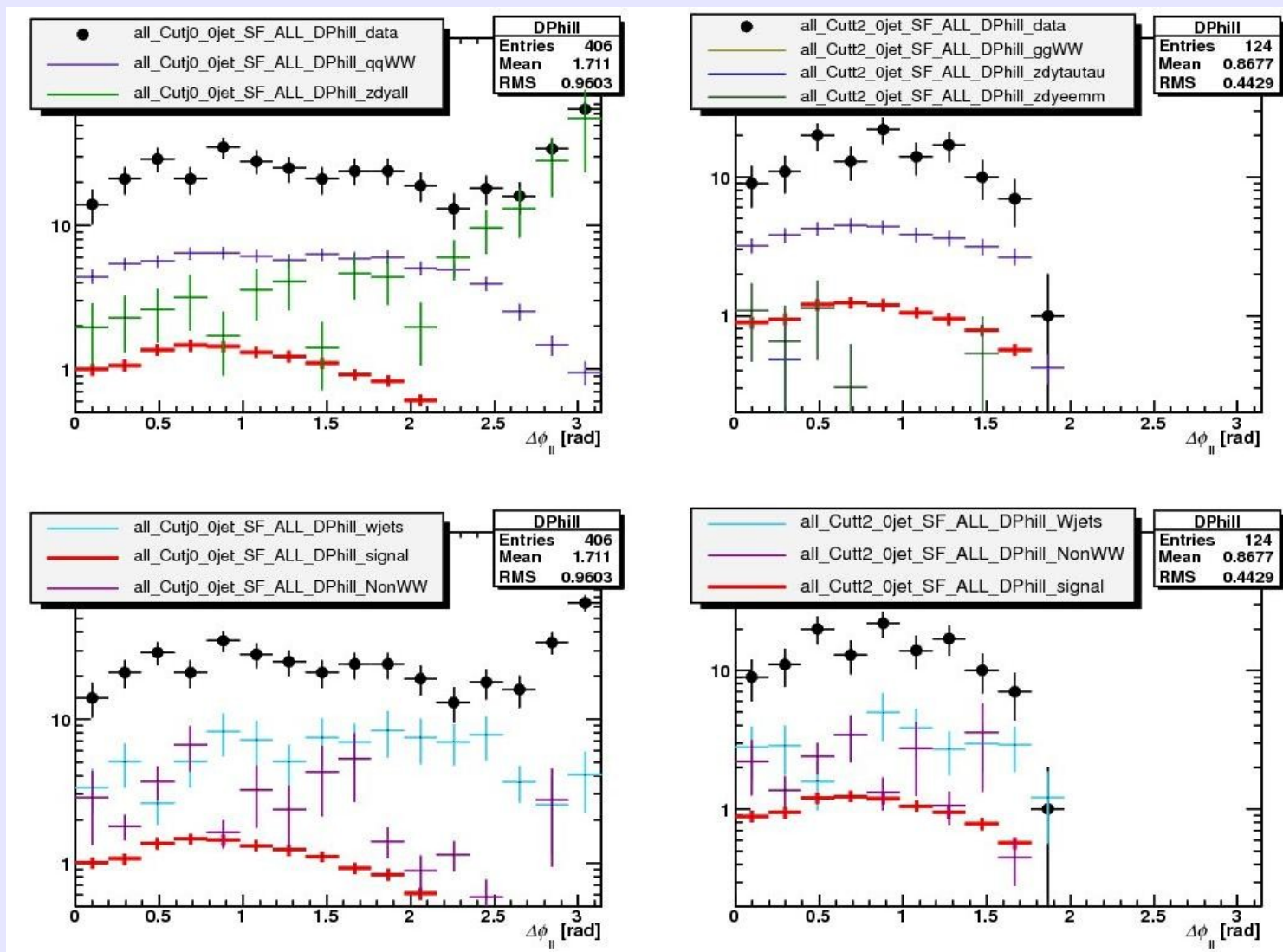
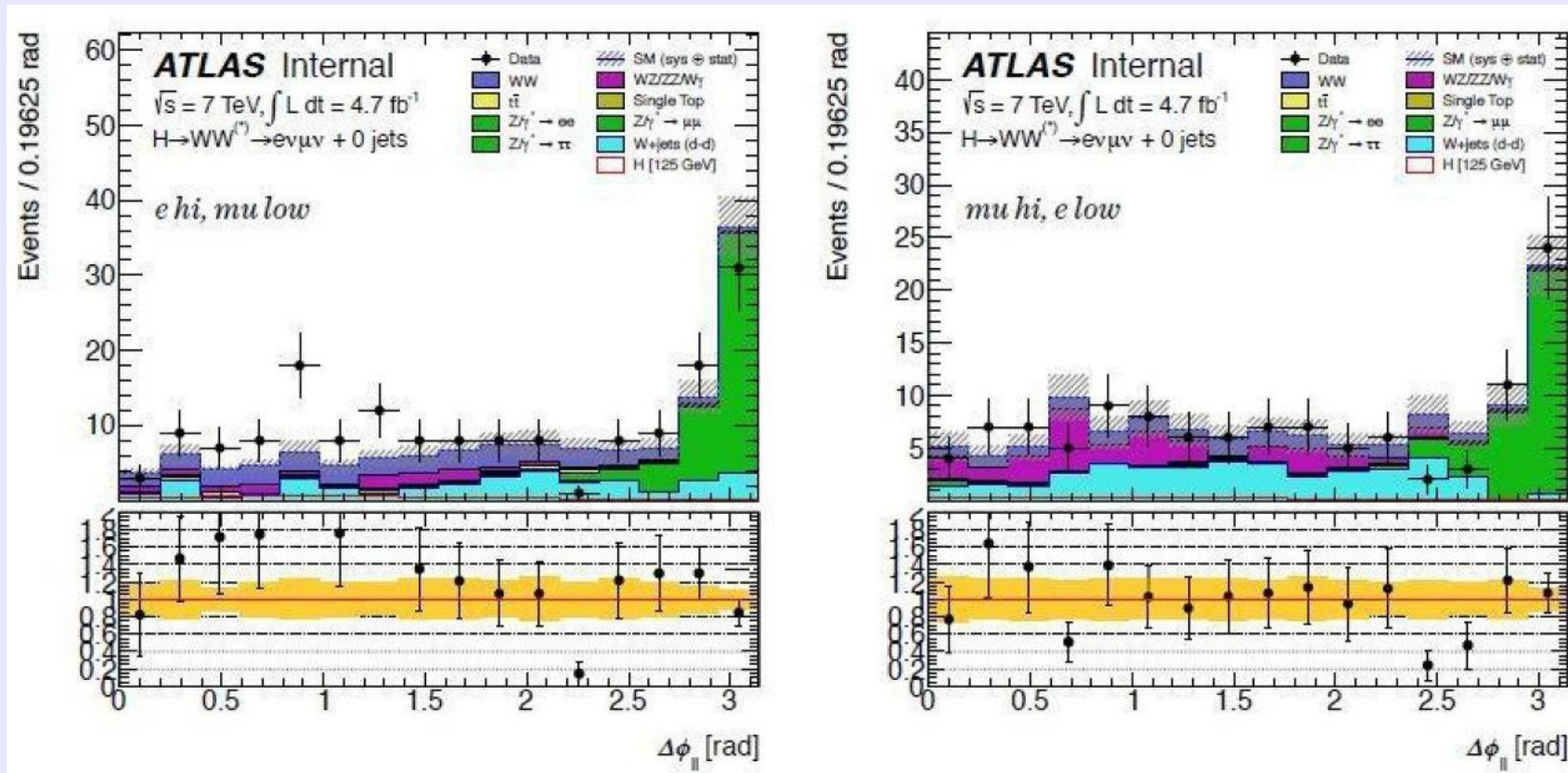Focusing on a few plots for today

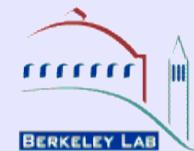Unstacked distributions of data and backgrounds

e-mu and mu-e channels

- Splitting the e-mu in ehi-mlow and mhi-elow showed that all of the excess is in events with a subleading muon.

Studies of the excess

- **Many checks have been made:**
    No detector effects have been found
    No time dependence (B-K and L-M periods agree within stat)
    Excess is already evident at the Jet Veto level
        and more....NO SMOKING GUN WAS FOUND

- Major backgrounds are the WW background and the W+jets

    WW Background:
        Agreement between data and predixtion in Control Regions
          has been checked
        Alternative CR have been looked at
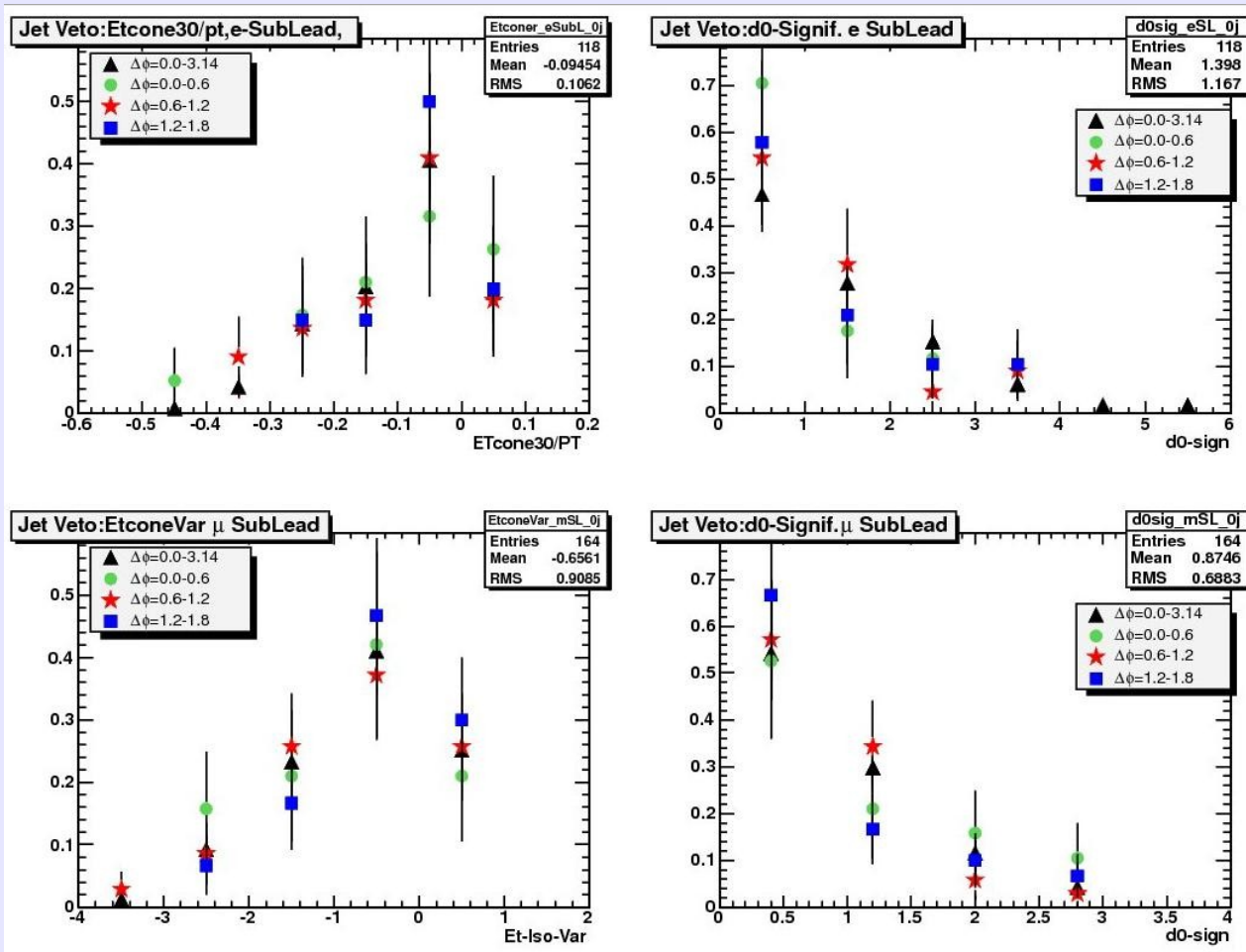   tau polarization has been checked

    W+jets:
        Remains the prime suspect for the excess.

Lepton Isolation and Impact parameter

- The excess is in the 0.6-1.2 $\Delta\Phi$ region.
- Isolation and d0 significance are plotted in bins of $\Delta\Phi$


- No dependence on the bin of $\Delta\Phi$ is observed for the isolation

- No tail of the d0 significance is observed. Heavy flavor not major component of background.

- Charm can still contribute. D_s too small.

STUDY of the MT CUT

- For the nominal analysis a dependence on the MT has been suggested. In particular a cut at MT > 90 GeV.
- At Jet Veto level, the distributions for the SubL μ or e look somewhat different for the lowpT analysis. Narrower for the mu-e channel in the data, not in the expectation.
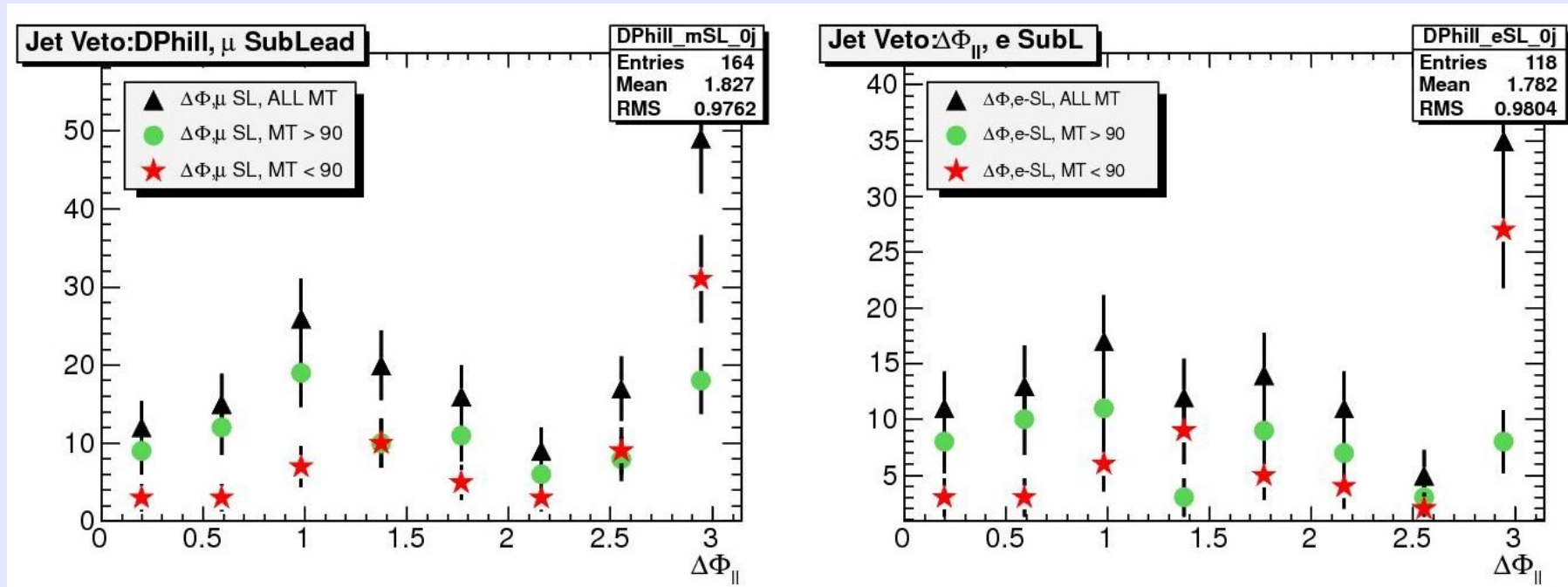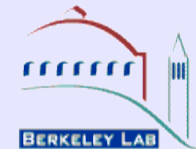- **These are 2011 data and are NOT BLINDED**
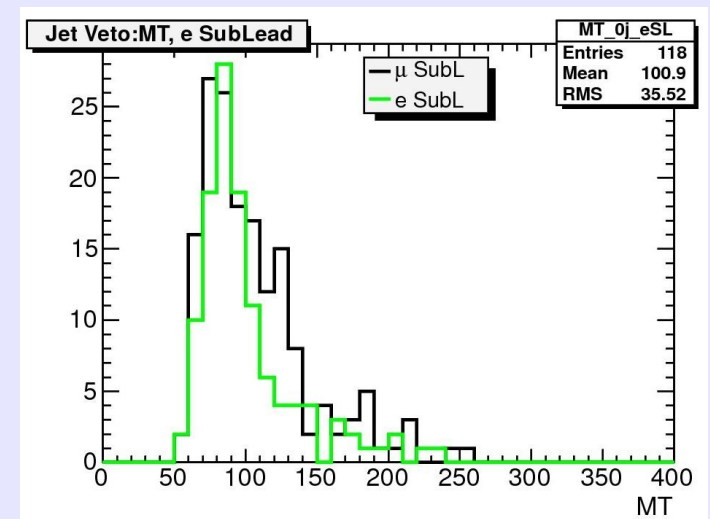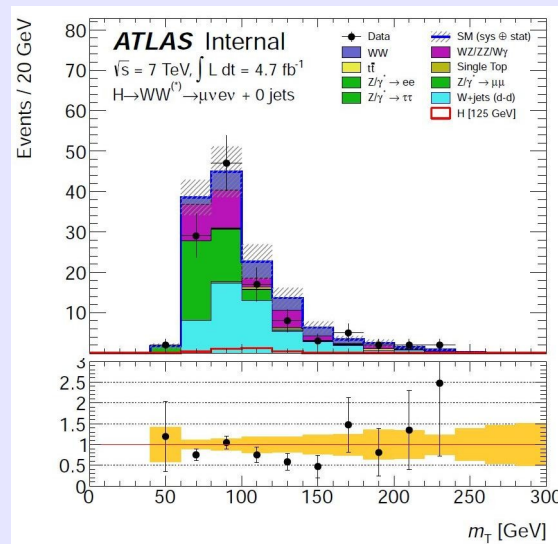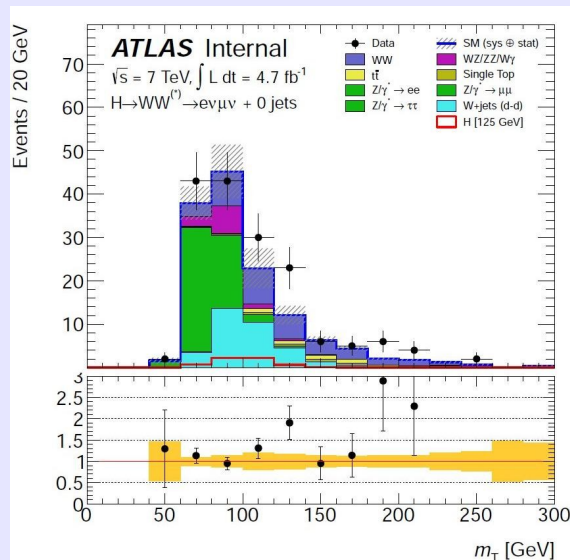
Plot on the right is data only.

MT Dependence of ΔΦ Distribution

- m Sublead event (left), e SubLead (right) at Jet Veto Level.

- The MT < 90 GeV events peak to the right of Dphi=1.0
  where the excess occurs in both distributions.
  This agrees with the plots on the previous page where we
  see a small excess only in the e-mu events, at MT>90.

Summary

- Looked at lepton isolation and impact parameter significance of the 2011 low Pt data in bins of $\Delta\phi_{ll}$. Found no dependence on $\Delta\phi_{ll}$

- Looked at MT dependence of the excess as a function of $\Delta\phi_{ll}$. Found that MT < 90 GeV events do not contribute to the excess in the e-mu channel.
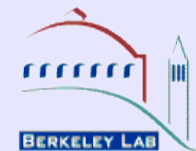
Backup Slides

Flavor Dependence of Excess

The excess in the 2011 data is mostly in the ehi-mulow channel

Cutflow for different flavors

Lepton channel	ee	$\mu\mu$	eμ	all
Cut 11				
signal	2.2 ± 0.2	5.1 ± 0.3	13.3 ± 0.9	20.6 ± 1.3
Total Back	159 ± 24	271 ± 33	770 ± 114	1201 ± 170
observed	144	263	828	1235
Jet Veto				
signal	1.4 ± 0.1	3.3 ± 0.3	8.9 ± 0.8	13.6 ± 1.2
Total Back.	41 ± 9	80 ± 15	255 ± 63	376 ± 85
observed	43	81	282	406
$P_{T,ll} > 45, 30$ GeV				
signal	0.76 ± 0.08	1.6 ± 0.2	7.5 ± 0.7	9.8 ± 1.9
Total Back.	9.7 ± 3.1	15 ± 2	90 ± 10	115 ± 14
observed	6	20	117	143
Final Sample, with $\Delta\Phi < 1.8$				
signal	8.9 ± 0.8	0.7 ± 0.1	1.6 ± 1.1	6.6 ± 0.6
Total Back.	9.3 ± 3.0	14.2 ± 2.3	73 ± 8	96 ± 11
Observed	5	**19**	**100**	**124**

← excess

← excess

No excess in ee, excess in both eμ and $\mu\mu$